



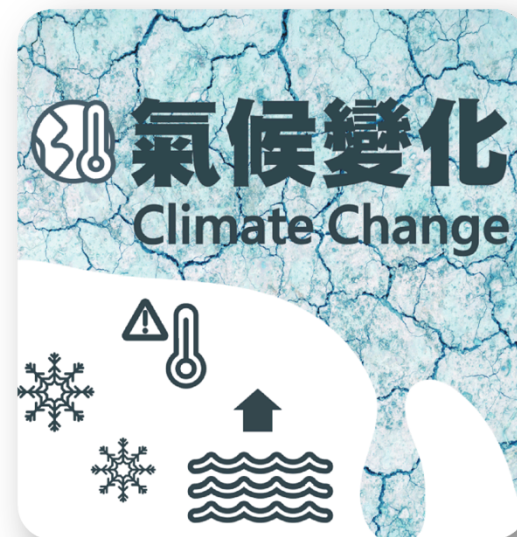
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Fieldwork on urban microclimate and related mobile application for data collection

城市微氣候實地考察及利用相關應用程式作數據蒐集





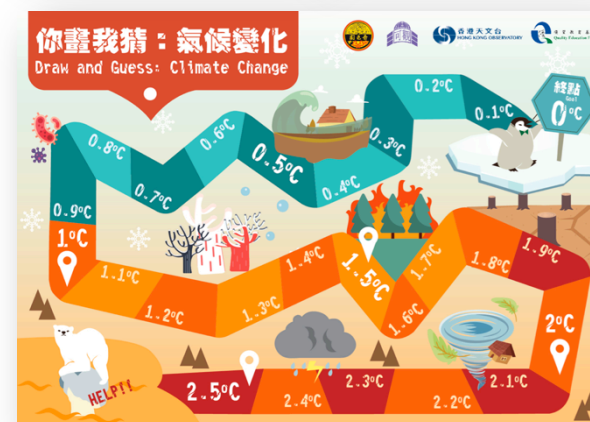
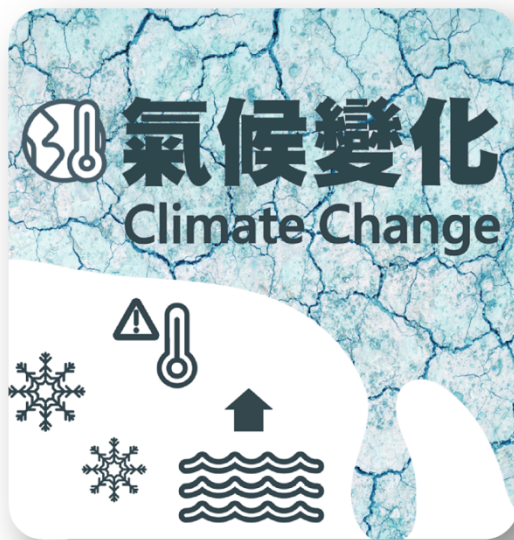
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Content:

- (1) teaching kit;
- (2) board game learning set;
- (3) mobile application about climate change.





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(3) Mobile application

- iPad version only
- Free download from App Store
- Four-in-one scheme including parts of
 - a) global climate change
 - b) climate change in Hong Kong
 - c) climate change quiz game
 - d) weather data collection and analysis*

*internet connection required





(3) Mobile application

- assisting data-logging and incorporating the functions of
 - i) user/group management;
 - ii) maps;
 - iii) geotagging;
 - iv) time logging;
 - v) input and export of data; and
 - vi) preview of diagrams
- All the collected data can be exported for further analysis in enquiry-based fieldwork.



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Enquiry Fieldwork

- A. Planning and preparation
- B. Data collection
- C. Data processing, presentation and analysis
- D. Interpretation and conclusion
- E. Evaluation



7. Climate Change — Long-term fluctuation or irreversible trend?

This module introduces the issue of climate change as a typical example of the interaction between humans and the natural environment. The focus of the issue is on whether climate change, in particular global warming, is just a longer term climatic fluctuation. This module leads students to examine the evidence to investigate whether climate change is an irreversible phenomenon. In addition to studying the causes and impact of climate change at a global scale, this module also has a second focus on local climate change, mainly the combined influence of global warming and urbanisation. The investigation of the issue will also ensure that students acquire a basic understanding of the elements and associated patterns of the local and global climate. Moreover, they should be able to understand better how human activities affect our natural environment, and how resulting changes of the natural environment in turn affect us.

Guiding Questions	Explanatory Notes	Concepts	Skills and Suggested Learning Activities
<ul style="list-style-type: none">7. Is our climate also changing at a local scale?8. How is the climate of our urban areas different from our rural areas? Why is there such a difference?9. What are the effects of urban growth and development on the climate of our city?	<ul style="list-style-type: none">Urban growth and development leading to local variations in climate, focusing on heat island effectEffects of urban growth and development on microclimate, in terms of atmospheric composition, temperature, sunshine, precipitation, humidity and windObserved climate change in Hong Kong	<ul style="list-style-type: none">MicroclimateUrban climateHeat island effectSpatial variation	<ul style="list-style-type: none">Use data loggers / measuring meters / apps and software programmes in the field to collect data of microclimate.Use GIS or other computer software to plot the data collected from a urban climate fieldwork onto a digital map.Construct a map to show the spatial variation of microclimate in an urban area.Construct a scatter diagram to show the correlation between an element of urban climate (e.g. temperature) and the distance from the urban centre.



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Urban Microclimate Fieldwork Study

Microclimate is a **special climatic situation within a small range**, mainly affected by factors such as topography, wind direction, building orientation and density.

(1) Enquiry question:

Example: Temperature decreases with increasing distance from Nathan Road.

Example: The temperature decreases with increasing vegetation cover.

Example: Wind speed is lower with increasing distance from the sea.



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(2) Scope of study

Checkpoint 1





(2) Scope of study

Checkpoint 2





(2) Scope of study

Checkpoint 3





(2) Scope of study

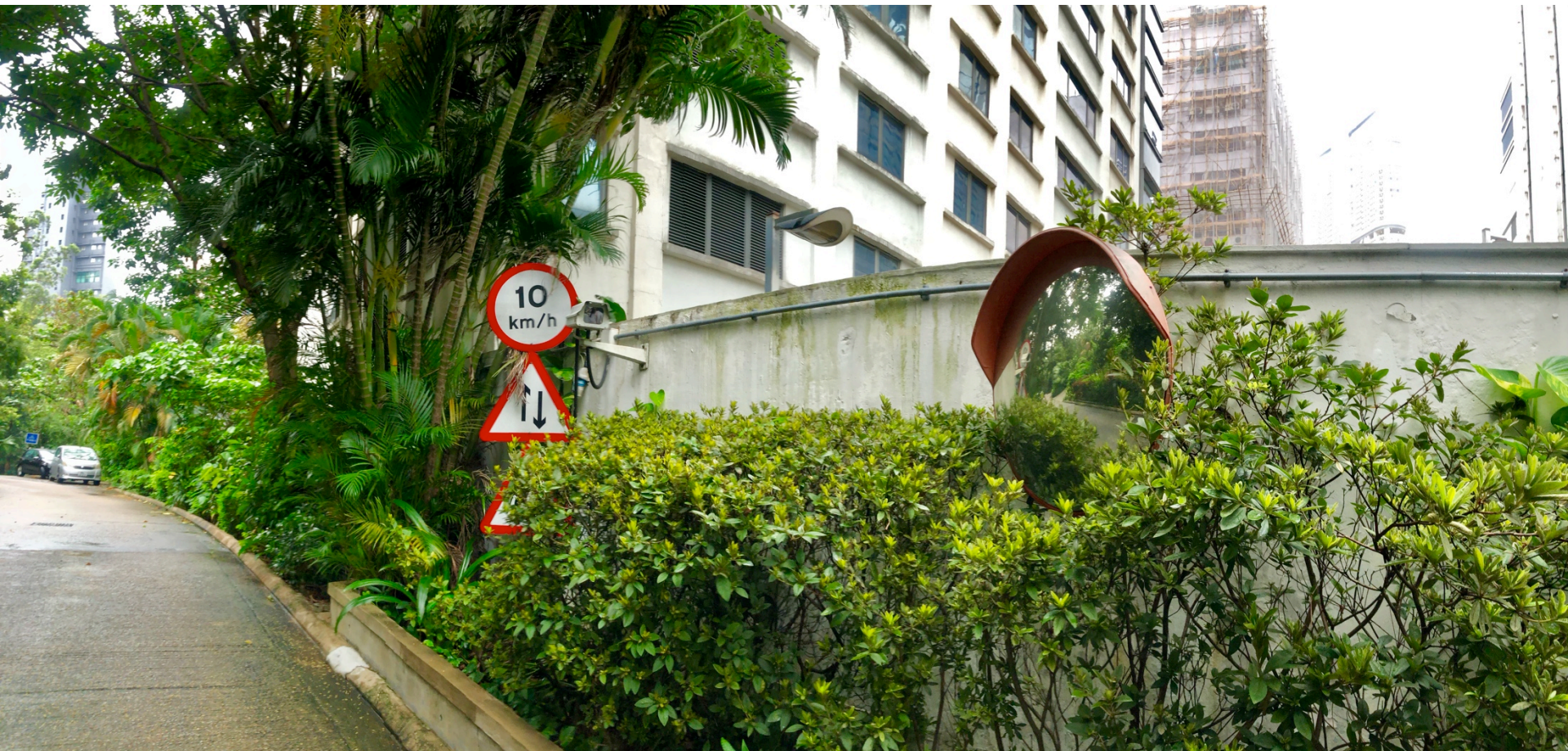
Checkpoint 4





(2) Scope of study

Checkpoint 5





(2) Scope of study

Checkpoint 6





(2) Scope of study

Checkpoint 7





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(2) Scope of study

Checkpoint 8





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(3) Data collection

Items (unit)	Equipment
a. Temperature ($^{\circ}\text{C}$)	Heat index wet bulb globe temperature (WBGT) meter
b. Relative humidity (%)	
c. Wind speed (m/s)	Anemometer
d. Wind direction ($^{\circ}$)	Compass
e. Air pressure (hPa)	Barometer
f. Light intensity (lx)	Light meter



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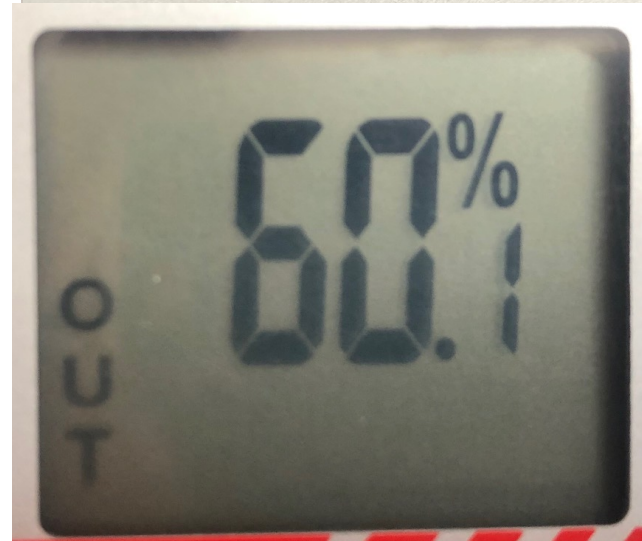
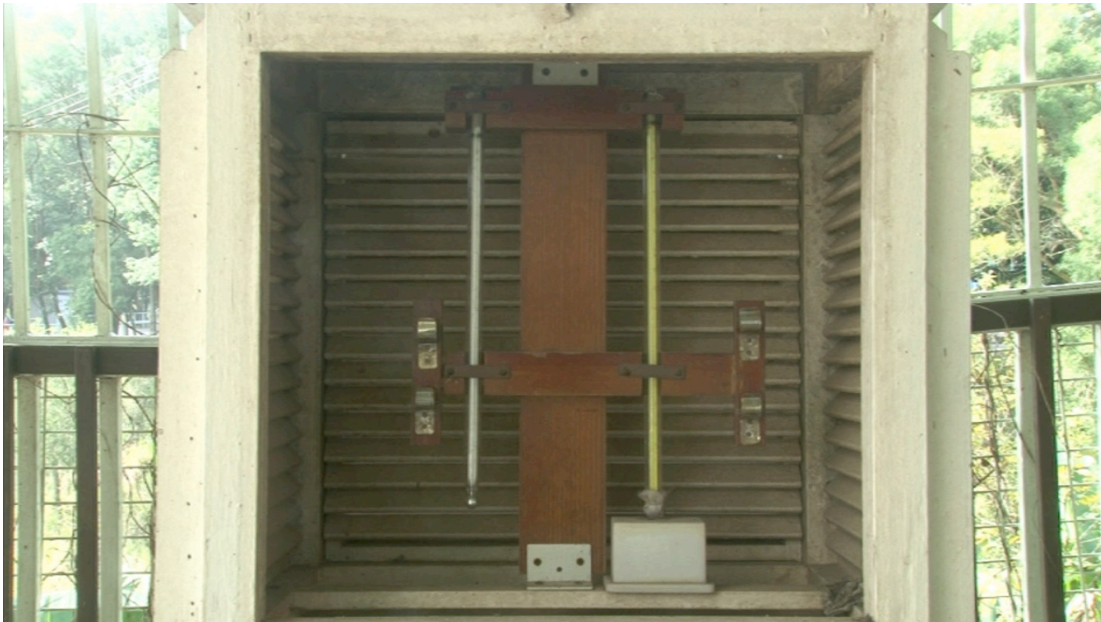
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(3) Data collection

a. Heat index wet bulb globe temperature (WBGT) meter

- Temperature ($^{\circ}\text{C}$)
- Relative humidity (%)

Hygrometer with Celsius Table





(3) Data collection

b. Anemometer

- Wind speed (m/s)
- Temperature ($^{\circ}\text{C}$)

Wind Vane





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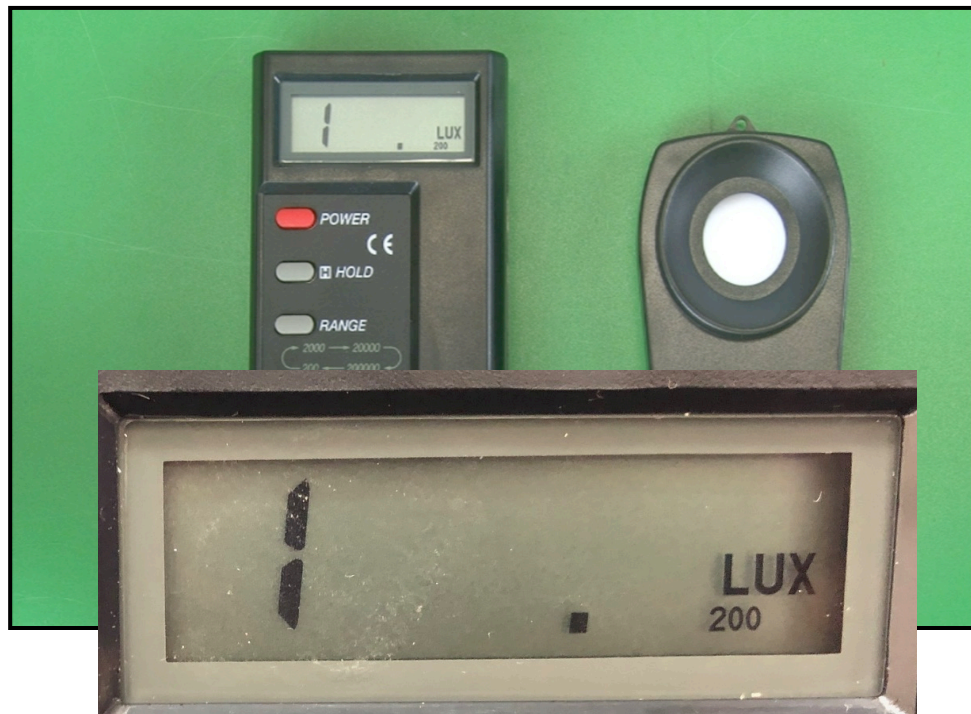


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(3) Data collection

c. Light meter

- Light intensity (lx)





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(3) Data collection

d. Barometer

- Air pressure (hPa)
- Altitude (m)





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(3) Data collection

Checkpoint ()	15:	15:	15:
a. Temperature ($^{\circ}\text{C}$)			
b. Relative humidity (%)			
c. Wind direction ($^{\circ}$)			
d. Wind speed (m/s)			
e. Air pressure (hPa)			
f. Light intensity (lx)			

Comparison between two variables in a group's data?



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(3) Data collection

Checkpoints	1.	2.	3.	4.	5.	6.	7.	8.
Distance from Nathan Road (m)	250	247	205	155	105	55	0	0
Absolute altitude (m)	100	68	68	65	61	57	47	47
a. Rooftop								
b. Ground								
c. Covered with cement								
d. Covered with grass								
e. Covered with trees								
f. Close to building(s)								



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(3) Data collection

4:40 PM Mon 28 Jan

99%

WEATHER DATA COLLECTION & ANALYSIS



Experience the weather data collection

This part is a tool to facilitate geography enquiry fieldwork, assisting students to experience data collection, manage data collected from primary sources and conduct data processing and graphic analysis. Students can carry out their investigations as individuals, collecting weather data in the same location at different periods of time; or in groups, collecting weather data in different locations at the same time. All the uploaded data and related diagrams can be exported for further analysis in studies like microclimate or weather changes.

I AM AN

ADMINISTRATOR

USER



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(3) Data collection - Fieldwork

ClassRoom

seminar 20190621

Your Class Number

a	h	o	e
---	---	---	---

OK



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(4) Error

Temperature (°C)	Humidity (%)	Speed (m/s)	Direction (°)	Intensity (lx)	Pressure (hPa)
31.00	53.00	0.70	90.00	100900.00	1023.00
32.00	48.00	0.00	280.00	87100.00	1022.00

The value you entered is out of range.

OK

1. Temperature (°C)

33

2. Relative Humidity (%)

46

3. Wind Speed
(m/s)

0.4

4. Wind
Direction (°)

270

5. Light Intensity (lx)

94100000

6. Air Pressure (hPa)

1023



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(4) Error



DATA COLLECTION

	Record Time	Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (°)	Light Intensity (lx)	Air Pressure (hPa)
01	10:00	29.00	76.00	1.50	180.00	12000.00	1011.00
02	10:10	28.50	77.00	0.00	0.00	18600.00	1012.00
03	10:20	49.00	75.00	0.30	90.00	111000.00	1012.00
04	10:30	30.00	69.00	1.10	45.00	100500.00	1011.00
05	10:40	30.00	69.00	1.20	45.00	106000.00	1011.00

Record Number
03

Record Time
10:20

1. Temperature (°C)

49.00

2. Relative Humidity (%)

75.00

3. Wind Speed
(m/s)

0.30

4. Wind
Direction (°)

90.00

5. Light Intensity (lx)

111000.00



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(4) Error

DATA COLLECTION



	Record Time	Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (°)	Light Intensity (lx)	Air Pressure (hPa)
01	10:00	29.00	76.00	1.50	180.00	12000.00	1011.00
02	10:10	28.50	77.00	0.00	0.00	18600.00	1012.00
03	10:20	49.00	75.00	0.30	90.00	111000.00	1012.00
04	10:30	30.00	69.00	1.10	45.00	100500.00	1011.00
05	10:40	30.00	69.00	1.20	45.00	106000.00	1011.00

Record Number
03

Record Time
10:20

1. Temperature (°C)

49.00

2. Relative Humidity (%)

75.00

3. Wind Speed
(m/s)

0.30

4. Wind
Direction (°)

90.00

5. Light Intensity (lx)

111000.00

6. Air Pressure (hPa)

1012.00



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(4) Error



DATA COLLECTION



	Record Time	Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (°)	Light Intensity (lx)	Air Pressure (hPa)
01	10:00	29.00	76.00	1.50	180.00	12000.00	1011.00
02	10:10	28.50	77.00	0.00	0.00	18600.00	1012.00
03	10:20	29.00	75.00	0.30	90.00	111000.00	1012.00
04	10:30	30.00	69.00	1.10	45.00	100500.00	1011.00
05	10:40	30.00	69.00	1.20	45.00	106000.00	1011.00

1. Temperature (°C)

2. Relative Humidity (%)

3. Wind Speed (m/s)

4. Wind Direction (°)

5. Light Intensity (lx)

6. Air Pressure (hPa)



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DATA ANALYSIS



Middle income residential land use

Temperature

Relative Humidity

Wind Speed

Wind Direction

Light Intensity

Air Pressure

Please select graph type

Line Chart

Pre-set Comparison



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(4) Error





(4) Error





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(4) Error





(4) Error





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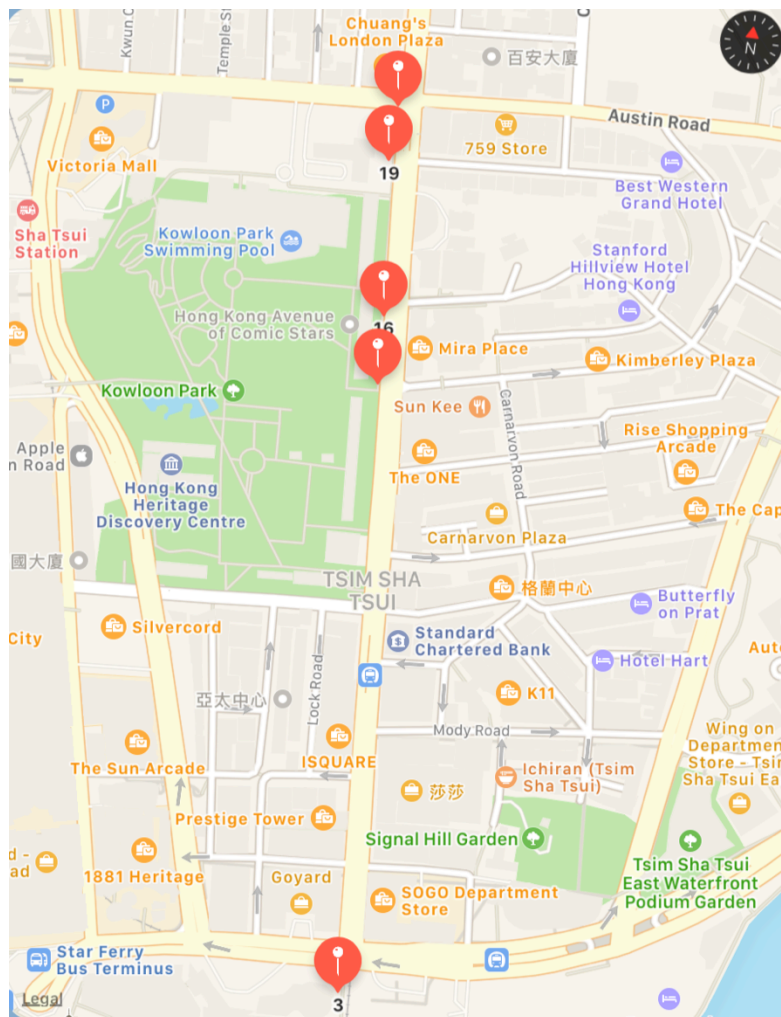
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Sample 1 – Random sampling

5 random points along Nathan Road



PLEASE SELECT A GROUP

Group Number: 3

Space Museum



Group Number: 15

Kimberly Road



Group Number: 16

Mira Place



Group Number: 19

Tsim Sha Tsui Police Station



Group Number: 20

Austin Road



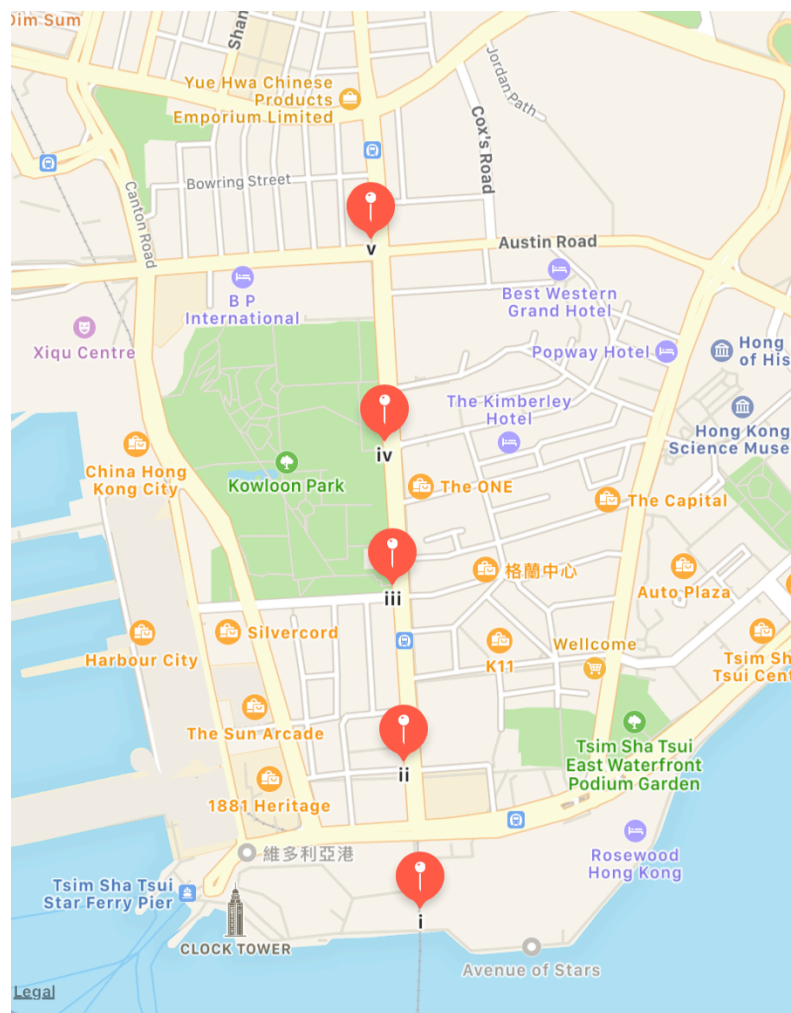


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Sample 2 - Systematic sampling Every 260 m along Nathan Road



PLEASE SELECT A GROUP

Group Number: i distance from the sea: 0 m



Group Number: ii distance from the sea: 260 m



Group Number: iii distance from the sea: 520 m



Group Number: iv distance from the sea: 780 m



Group Number: v distance from the sea: 1040 m





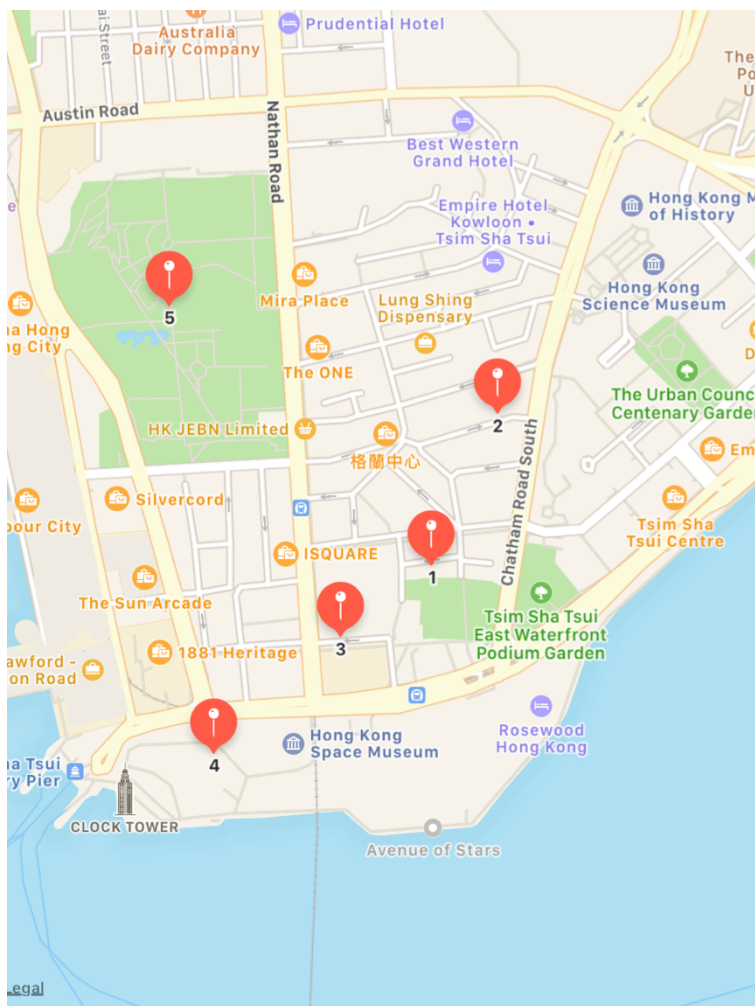
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Sample 3 – Stratified sampling

Different landuses in Tsim Sha Tsui



PLEASE SELECT A GROUP

Group Number: 1

High income residential
landuse



Group Number: 2

Low income residential
landuse



Group Number: 3

Commercial landuse



Group Number: 4

Institutional landuse



Group Number: 5

Recreational landuse





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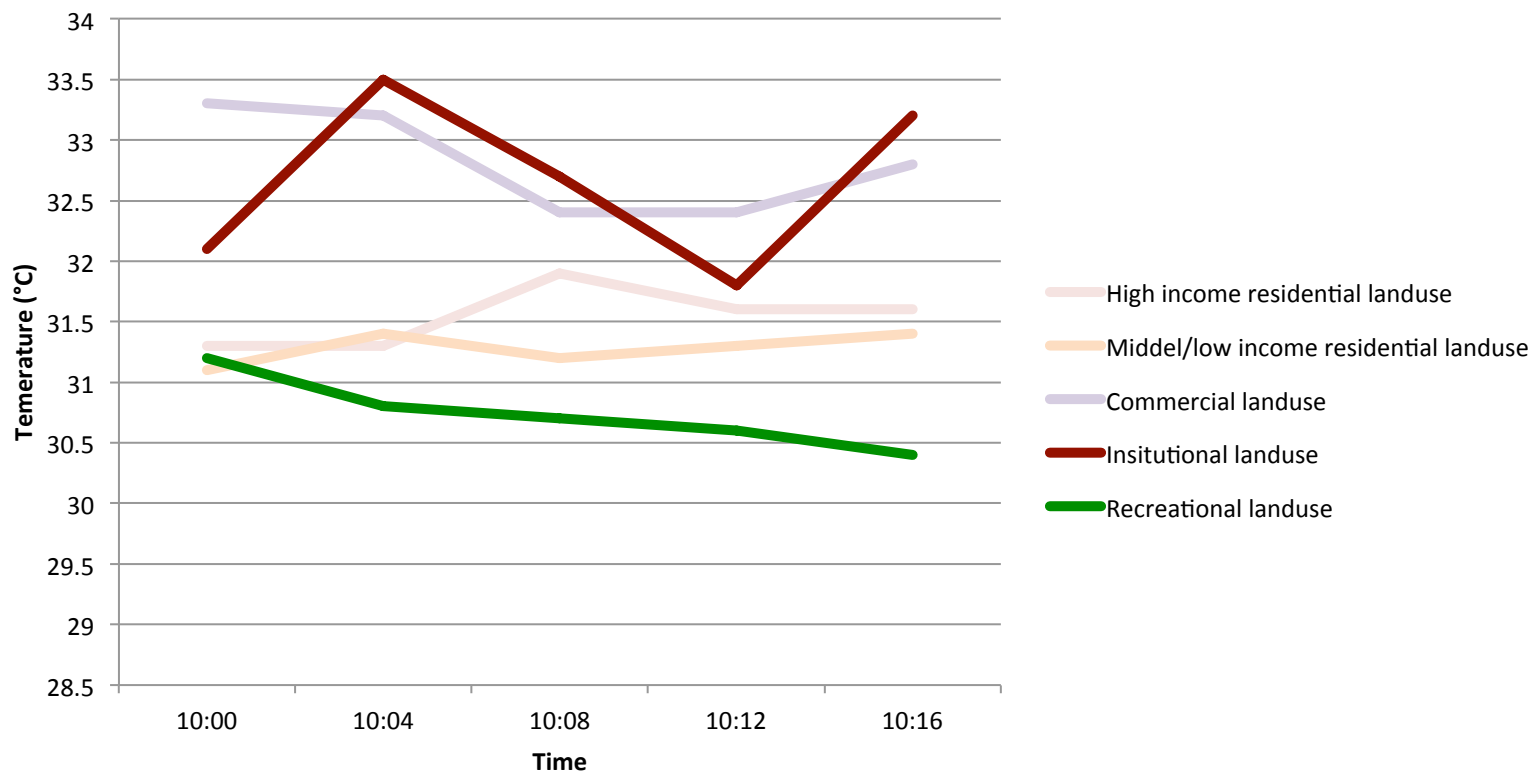
Sample 3 – Stratified sampling

Different landuses in Tsim Sha Tsui

Enquiry question: Temperature is lower in recreational landuse.



Temperature among different landuses





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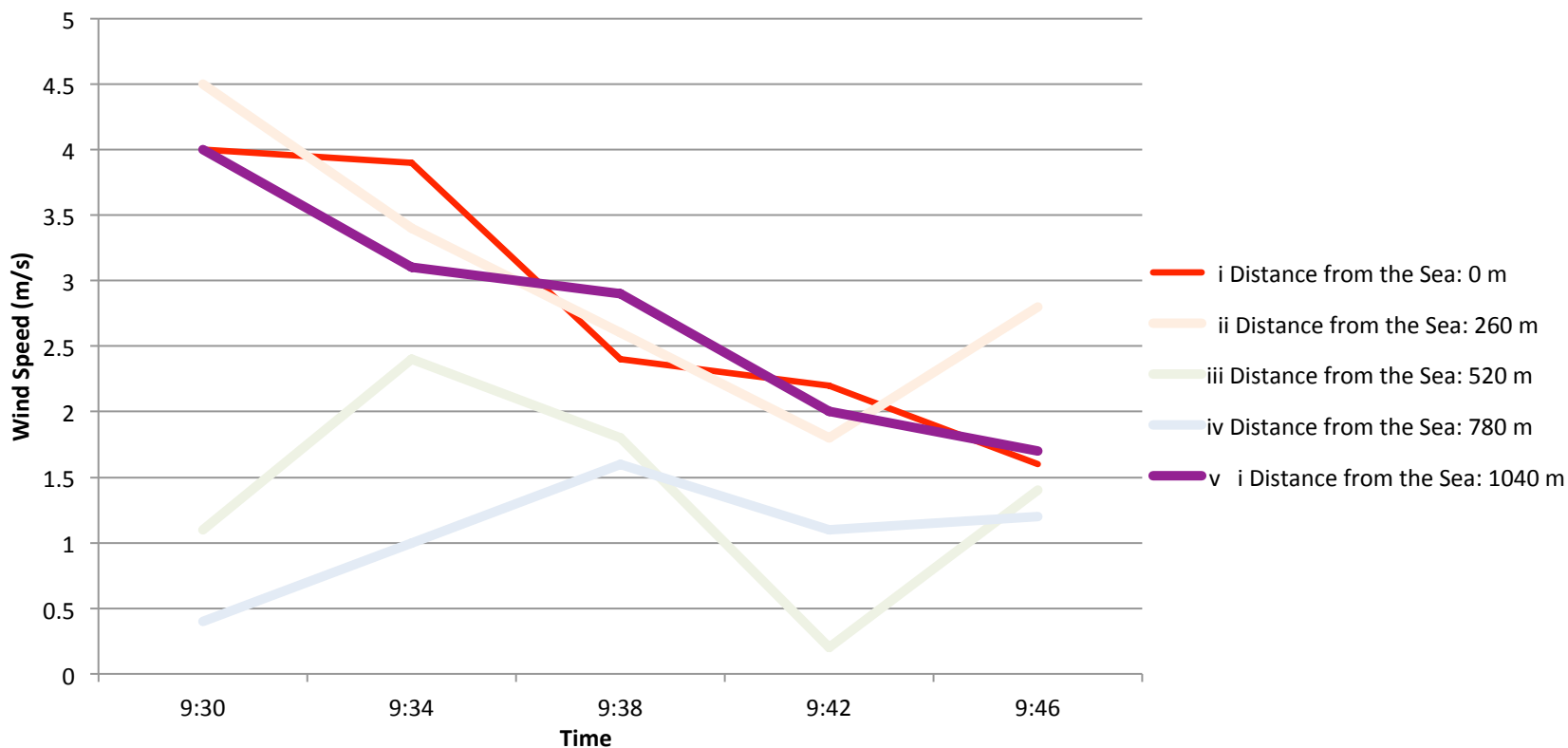
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Sample 2 - Systematic sampling Every 260 m along Nathan Road

Enquiry question: Wind speed decreases with increasing distance from the sea.



Wind speed among 5 systematic sampling points





Sample 1 – Random sampling 5 random points along Nathan Road

	Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Light Intensity (lx)	Air Pressure (hPa)
Average	31.90	69.28	1.48	18611.83	1006.55

Sample 2 - Systematic sampling Every 260 m along Nathan Road

	Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Light Intensity (lx)	Air Pressure (hPa)
Average	31.96	69.34	2.20	34831.88	1007.10

Sample 3 – Stratified sampling Different landuses in Tsim Sha Tsui

	Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Light Intensity (lx)	Air Pressure (hPa)
Average	31.81	68.54	1.26	13826.40	1007.06



(5) Evaluation:





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(5) Evaluation:





(5) Evaluation:





(5) Evaluation:





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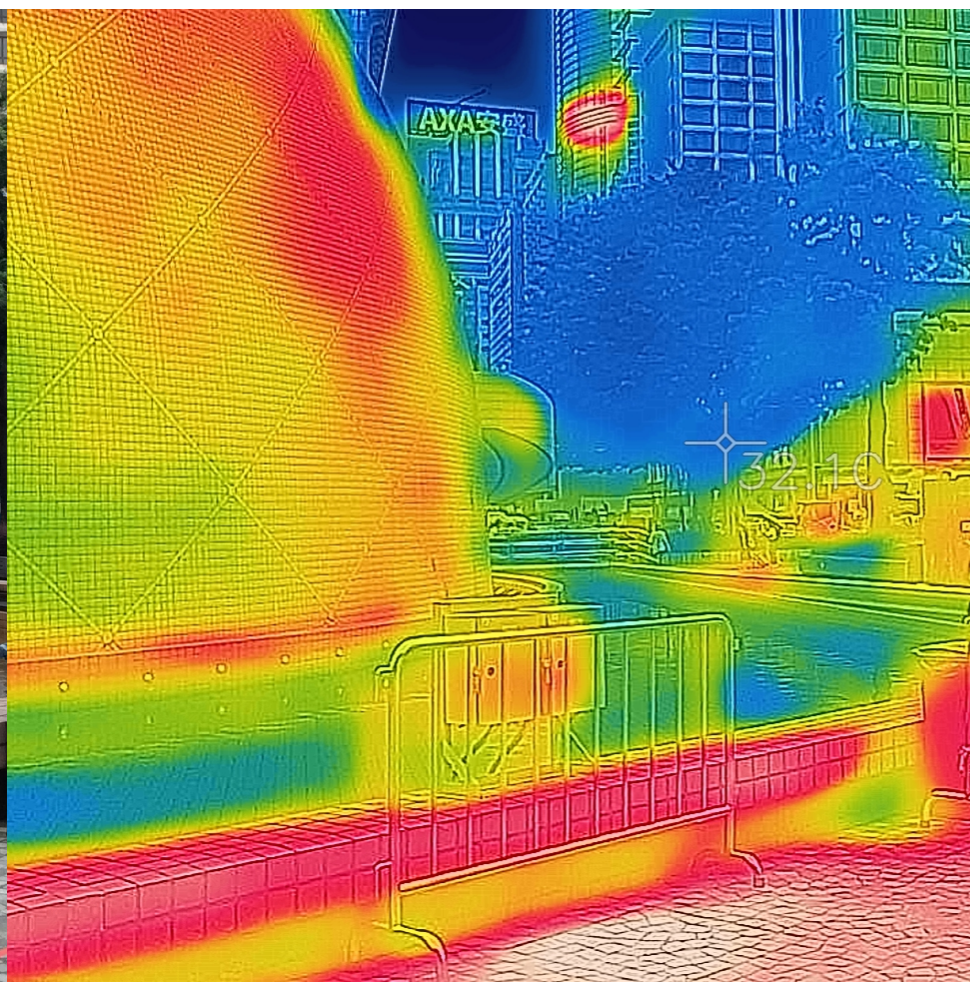
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(5) Evaluation:





(5) Evaluation:





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(5) Evaluation:

- Other enquiry topics?
- Other data collection items?
- Other equipment?
- Other sampling methods?
- Other sampling frequency?
- Other sampling time?
- ...



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